Lammergeier [*Gypaëtus barbatus*] on a cliff just below the Simla cart-road which is appropriated during the summer by a pair of Kestrels. Reid found the bird breeding in company between Almora and Naini Tal in May. Its food consists of insects, frogs, and small mammals, while once the above-named authority found it feasting on a Dove (*Turtur suratensis*).

No. 1265. Tinnunculus cenchris. *Lesser Kestrel.*

Apparently a rare winter visitor. Possibly it has been overlooked. Its smaller size and whitish or pale horny claws—instead of black, as in *T. alaudarius*—distinguish it at once. Two local skins—of which I can find only one—are in the Museum, and two more specimens are said to have been obtained here by the late Mr. Anderson.

[To be continued.]

V.—*Remarks on the Flight of Albatrosses.* By Captain F. W. Hutton, F.R.S.

Sailors apply the name "Albatross" to the large species with white backs, and distinguish the smaller forms of the Southern Ocean—with black backs and a dark border to the anterior edge of the lower surface of the wing—as "Mollymawks." The breeding-habits in these two groups are very different; the Albatrosses choosing grassy flats, the Mollymawks rocky cliffs, on which to make their nests. The British Museum Catalogue, however, takes the shape of the bill as a character by which to separate the birds; thus placing *Diomedea melanophrys*, which is the typical Mollymawk, among the Albatrosses.

In the Pliocene Period Albatrosses inhabited the North Atlantic Ocean; but at the present time they are practically limited to the North Pacific, as far south as 20° N., the coast of Peru, and the Southern Ocean between 30° S. and 60° S. Several are dark in colour when they are young and get whiter as they grow old; and this points to the probability of *D. nigripes*, of the North Pacific, which remains dark throughout life, being nearer to the prototype Albatross than any other species now living.

Starting from *D. nigripes* we have three groups:—The first includes *D. irrorata*, *D. immutabilis*, and *D. albatrus*, of the North Pacific, which have mottled under wing-coverts and the culmicorn in contact with the latericorn for a considerable distance behind the base of the nasal tube. The second group consists of the three species of true Southern Albatrosses—*D. exulans*, *D. regia*, and *D. chionoptera*—clearly linked together by their white under wing-coverts and the shape of the culmicorn, which has a very short, almost punctiform, contact with the latericorn behind the base of the nasal tube. The third group contains *D. melanophrys* alone, which has a bill resembling that of the northern Albatrosses, but with different colouring.

The genus *Thalassogeron*, which is entirely southern, is connected through *D. melanophrys* with the northern Albatrosses, *D. irrorata* and *D. immutabilis*. It seems, therefore, probable that Albatrosses originated in the Northern Hemisphere and passed south through the Pacific Ocean.

No two species of Albatross or Mollymawk are known to breed in the same locality. Even when two different kinds are found on the same island—as *D. exulans* and *D. regia* on Adam's Island of the Auckland group—they occupy widely separated sites. So far as I know, *Thalassogeron salvini*, of the Bounty Islands, is the earliest species to breed, for it commences at the end of August. *D. melanophrys*, on Campbell Island, comes next, in the middle of September; then the Sooty Albatross, *Phœbetria fuliginosa*, in the end of October at the Antipodes and Auckland Islands, and a little later at Kerguelen Island. *D. regia* commences at Campbell Island in the middle of November; *D. chionoptera* at Kerguelen in the middle or end of December; *D. exulans* in the first week of January at Adam's Island and the middle of January at Antipodes Island; and last comes *T. culminatus* at the Snares Islands in the end of January. So that there is no less than five months' difference between the first and the last.

As these birds all live on the same food and have the same simple habits when they are at sea, we cannot suppose that their distinctive specific characters are due to natural selection, for that which would favour one would favour all. Nor can we suppose that they are due to the action of external conditions, because what would affect one would affect all. Nor can we suppose them to be recognition-marks, for, when the breeding-time is drawing near, each bird goes separately to its old nest before courtship begins. The pink feathers on the sides of the neck of *D. chionoptera* may possibly be due to sexual selection, but we cannot suppose that all the differences between the species have such an origin; for the birds appear to mate for life, so that there is very little opportunity for choice. It cannot, therefore, be that the species of Albatrosses were formed by competition on the ocean, and subsequently chose separate breeding-grounds. We must believe that isolation preceded the development of their specific characters.

Now it is not difficult to imagine that those birds to which the breeding impulse came first should retire to their breeding-grounds and there mate; while those in which the impulse was delayed might find their old breeding-grounds fully occupied and would have to choose others. Thus, owing to physiological isolation, a small number of birds would become physically isolated and new specific characters might arise and be preserved. I believe that this method of physiological isolation has often played an important part in the origin of species without any help from natural selection, not only in birds, but also in insects. It is evident that in an equable climate, where the exact time of breeding was not very important, many variations might be preserved by this means; while in more rigorous climates, where the breeding-season must necessarily be short, this kind of physiological isolation could not occur. And this may account for the greater number of species in tropical countries, especially on islands, as contrasted with the enormous number of individuals belonging to very few species which is characteristic of temperate regions with continental climates.

One of the most peculiar and characteristic habits of the Albatrosses—as well as of all the larger Petrels—is their so-called "sailing" method of flight, which enables the birds to

Fig. 7.

Albatross turning sharply to the left.

keep on the wing all day with very little exertion. Of course, it is not true sailing, but some word is wanted to distinguish it from the soaring of Vultures, Pelicans, and other birds. For the flight of the Petrels is performed near the surface of the sea and the birds make irregular curves with such sharp turns that their outstretched wings are, when turning, in an almost perpendicular position (see fig. 7). Vultures, when soaring, ascend to a considerable height, and then wheel

Fig. 8.

Albatross rising and turning to the right.

round and round in great circles, always keeping their wings horizontal.

Sailing flight depends, of course, upon the principle of the inclined plane. The bird acquires momentum by flapping its wings and then, holding them extended and motionless, waits until its momentum is nearly exhausted, when it once more propels itself forward as before. In the case of the Sooty Albatross the interval may, under favourable conditions, be about half an hour, and the difficulty is to explain why the friction of the air does not sooner bring the bird to a standstill. It was pointed out in 1889 by Mr. A. C. Baines * that the birds usually rise in a slanting direction against the wind (fig. 9), turn round in a rather large circle, and make a rapid descent (fig. 10) down the wind. They subsequently take a longer or shorter flight in various directions, almost touching the water. After that comes another ascent in the same manner, followed by another series of

Fig. 9.

Albatross commencing to rise.

movements. Now, as the velocity of the wind near the surface of the sea is diminished by the friction of the waves, when the bird ascends into the more rapidly moving upper current its *vis inertiæ* makes the wind blow past it, and so its stock of energy is increased. When it descends it will be

* 'Nature,' vol. xi. p. 9; and Lord Rayleigh, *t. c.* p. 34.

moving faster than the lower stratum of wind and will again develop new energy if its *inertia* is sufficient to prevent its attaining the new velocity of the wind at once. So that the bird must fly against the wind when ascending and with it when descending. Thus the energy constantly lost by the friction of the air is partially renewed by these manœuvres. This explains why the birds can sail longer in a high wind than in a calm. It is because in a high wind and with a high

Fig. 10.

Albatross descending and making a broad curve to the left.

sea there is much greater difference between the velocities of the wind near the surface and a short distance above it; and this, again, is an explanation of why an Albatross keeps so close to the surface of the sea, only just topping the waves and occasionally rising high in the air.

The foregoing sketches (figs. 7–10) are copied from enlarged photographs, the only good ones out of many failures. The difficulty of photographing flying birds from the deck of a rolling ship, often vibrating considerably, is great, and I have also found that the sea makes a very bad background; my most successful attempts were therefore made at birds above the horizon.

VI.—*On some rare or unfigured Eggs of Palæarctic Birds.* By H. E. Dresser, F.Z.S.

(Plate III.)

When selecting specimens for my former article on the eggs of certain Siberian Thrushes (Ibis, 1901, p. 445), I noticed one clutch, stated to belong to *Turdus dubius*, which differed somewhat from the rest, and on examining the parent bird, which had been shot at the nest, I found it to be undoubtedly a female *Turdus naumanni*.

As the eggs of this species have been hitherto quite unknown, I have thought it advisable to figure four out of the clutch, to shew what little variation is noticeable in them (see Pl. III. figs. 1, 2, 3, 6). Mr. Popham informs me that they were taken on the Yenesei River in 1900. He has also sent me another clutch, along with the parent bird, which, however, on examination proves to be a hybrid between *Turdus naumanni* and *T. dubius*. It would seem, therefore, that the breeding-range of these two species meets somewhere about the Yenesei, and that they occasionally interbreed, as is known to be the case with *T. atrigularis* and *T. ruficollis*.

Although the Mongolian Song-Thrush (*Turdus auritus* Verreaux) much resembles *T. musicus*, its eggs differ considerably from those of that species, being, as will be seen by the figures (Pl. III. figs. 4, 5), much more of the Misletoe-Thrush type. This Thrush inhabits Mongolia and Northern China. Prjevalsky found two nests in Kan-su in the middle of May—one on a broken tree-stump, and the other on the branch of a willow, about seven feet from the ground. One of the eggs now figured was obtained by Mr. Berezovski near Mindjeon, in Kan-su, while the other is from the collection of Mr. Goebel of St. Petersburg.